

DICHLOROETHYL ETHER [BIS(2-CHLOROETHYL ETHER)]

Dichloroethyl ether/Bis(2-chloroethyl ether) is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 111-44-4

$(\text{ClCH}_2\text{CH}_2)_2\text{O}$

Molecular Formula: $\text{C}_4\text{H}_8\text{Cl}_2\text{O}$

Dichloroethyl ether is a colorless, stable liquid with a pungent odor. It dissolves oils, fats, greases, etc., is miscible with organic solvents and with aromatic but not paraffin hydrocarbons, and is insoluble in water (HSDB, 1991; Merck, 1989). Dichloroethyl ether reacts with water or steam to evolve toxic and corrosive fumes and reacts vigorously with oleum and chlorosulfonic acid. It is incompatible with strong oxidizers and emits toxic fumes of chlorine when heated to decomposition (Sax, 1989).

Physical Properties of Dichloroethyl ether

Synonyms: BCCE; 1,1'-oxybis(2-chloro)ethane; 1,5-dichloro-3-oxapentane;
1-chloro-2-(beta-chloroethoxy)ethane; 2,2'-dichloroethyl ether;
2,2'-dichlorodiethyl ether; 2-chloroethyl ether; dichloroether; bis(chloro-2-ethyl) ether

Molecular Weight:	143.02
Boiling Point:	178 °C
Melting Point:	-24.5 °C
Flash Point:	131 °F (closed cup)
Vapor Density:	4.93 (air = 1)
Density/Specific Gravity:	1.22 at 20/20 °C (water = 1)
Vapor Pressure:	0.71 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	1.58 (HSDB, 1991) 1.29 (Howard, 1990)
Conversion Factor:	1 ppm = 5.85 mg/m ³

(Howard, 1990; HSDB, 1991; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

Toxic Air Contaminant Identification
List Summaries - ARB/SSD/SES
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A. Sources

Dichloroethyl ether is used as a reagent for organic synthesis, solvents, filling compounds, wetting and penetrating compounds, in spotting and dry cleaning, in aerosols, and in the manufacture of medicinals and pharmaceuticals. It is also used as a scavenger for lead deposits in gasoline. Dichloroethyl ether also can be formed in the chlorination of drinking water containing ethyl ether (HSDB, 1991).

B. Emissions

No emissions of dichloroethyl ether from stationary sources in California were reported, based on data obtained from the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1995a).

C. Natural Occurrence

No information about the natural occurrence of dichloroethyl ether was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of dichloroethyl ether.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of dichloroethyl ether was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

The dominant tropospheric loss process for dichloroethyl ether is by gas phase reaction with photochemically-produced hydroxyl radicals. The atmospheric half-life of dichloroethyl ether is estimated to be 1.5 days (Kwok and Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

Dichloroethyl ether emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to dichloroethyl ether [bis(2-chloroethyl ether)] are inhalation, ingestion, and dermal contact (U.S. EPA, 1994a).

Non-Cancer: Exposure to dichloroethyl ether may cause severe eye, skin and respiratory tract irritation. Dichloroethyl ether is a central nervous system depressant in high concentrations. Animal studies suggest that the liver and kidneys may be target organs. It can penetrate the skin to cause serious and even fatal poisoning (Sittig, 1991; U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) has determined that there are inadequate data for the establishment of a Reference Concentration (RfC) for dichloroethyl ether and has not established an oral Reference Dose (RfD) (U.S. EPA, 1994a).

No information is available on the adverse developmental or reproductive effects of dichloroethyl ether in humans. In one animal study, no effects were observed on the reproductive tissues of the animals, but no tests on reproductive function were performed (U.S. EPA, 1994a).

Cancer: No information is available on the carcinogenic effects of dichloroethyl ether in humans. Studies have reported an increased incidence of liver tumors in mice. The U.S. EPA has classified dichloroethyl ether as Group B2: Probable human carcinogen. The U.S. EPA has established an inhalation unit risk estimate of 3.3×10^{-4} (microgram per cubic meter)⁻¹. The U.S. EPA estimates that, if an individual were to breathe air containing dichloroethyl ether at 0.003 micrograms per cubic meter over his or her entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified dichloroethyl ether as Group 3: Not classifiable as to its carcinogenicity (IARC, 1987a).

The State of California has determined under Proposition 65 that dichloroethyl ether is a carcinogen (CCR, 1993). The inhalation potency factor that has been used as a basis for regulatory action in California 7.1×10^{-4} (microgram per cubic meter)⁻¹ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 microgram per cubic meter of dichloroethyl ether is estimated to be no greater than 710 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 2.5 (milligram per kilogram per day)⁻¹ (OEHHA, 1994).

